2.0 BACKGROUND

This report analyzes risk in areas that are the most densely populated or that exhibit hydrogeologic conditions that will affect the risks associated with different wastewater management options. Wastewater management needs in South Florida are most critical in southeast Florida and in the more densely populated cities along both the Atlantic and Gulf coasts of Florida. The interior of South Florida and the Everglades have the lowest density of wastewater treatment plants. The distribution of public municipal wastewater treatment plants in South Florida is shown in Figure 2-1 (FDEP, 2002). Municipal wastewater treatment plants reviewed for this study are listed in Table 2-1, according to the county in which they are located.

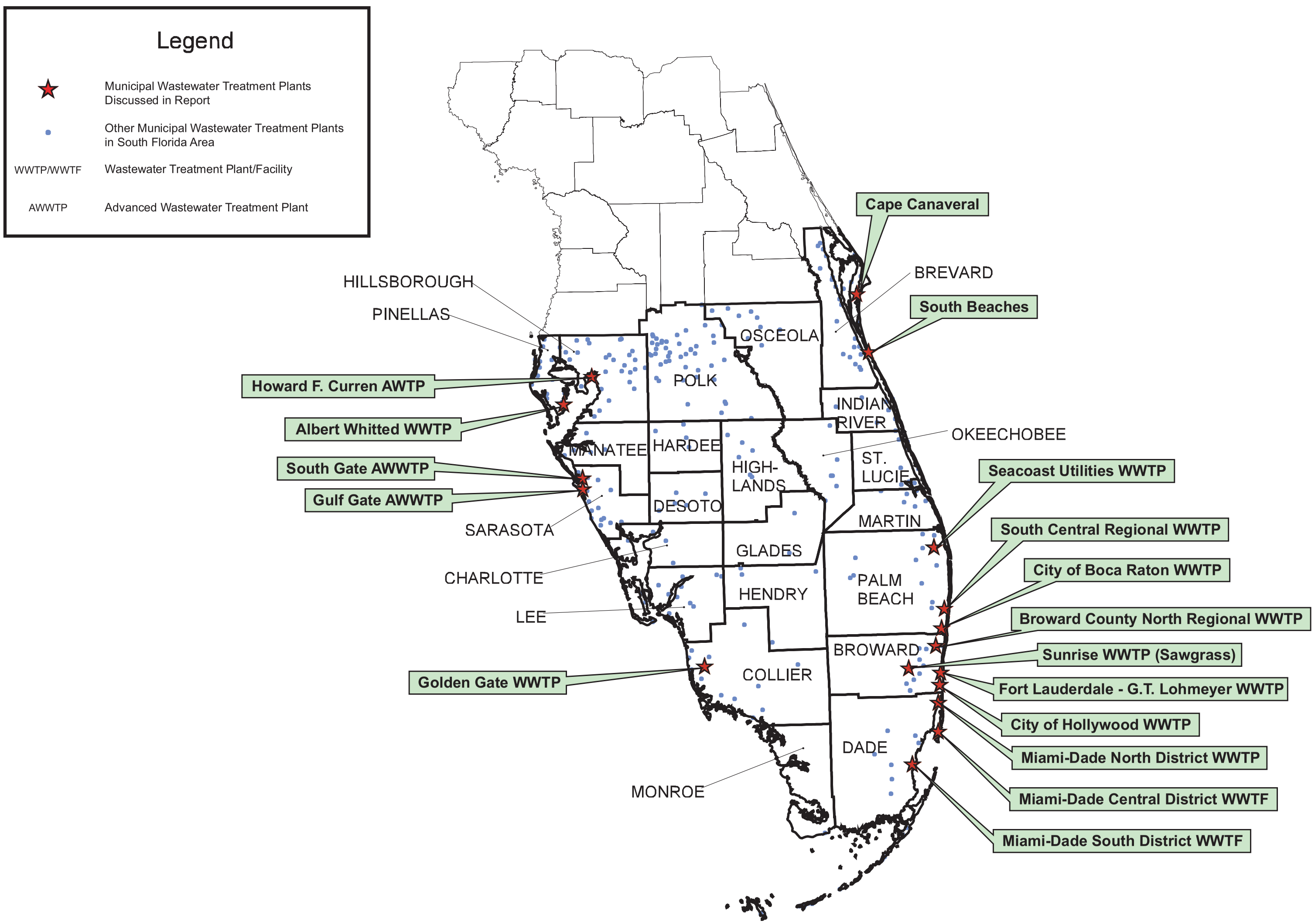
The tables in Appendix 1 provide data on the water quality of treated wastewater. Other data used in this study are also presented in Appendix 1, including data on the following topics:

- Chemical constituents (Appendix Table 1-1)
- The Southeast Florida Outfall Experiment or SEFLOE (Appendix Table 1-2)
- Microorganisms in wastewater (Appendix Table 1–3)
- Groundwater monitoring of fecal coliforms (Appendix Tables 1-4 and 1-5)
- Injection well locations, capacities, and treatment (Appendix Table 1-6).

2.1 Wastewater Management Options Used in South Florida

Wastewater treatment facilities often incorporate multiple management options to ensure continuous operation. The capacity of South Florida counties to manage treated wastewater using different management options is illustrated in Figure 2-2. Discharge volume capacities, not actual flow volumes, are represented in this figure. Information for this figure was obtained from the Florida Department of Environmental Protection (DEP) wastewater facilities database (FDEP, 2002) and the Florida DEP (personal communication, Kathryn Muldoon, February, 2002). Note that the DEP database does not always distinguish between Class I deep injection wells and Class V shallow injection wells.

Broward, Palm Beach, and Dade counties discharge the majority of their treated wastewater through ocean outfalls and deep injection wells. In Hillsborough, Sarasota, Pinellas, and Collier counties, aquifer recharge can be done using reclaimed water, surface water discharge, or deep injection well disposal, depending on irrigation needs and weather conditions. Facilities in Brevard County discharge reclaimed water to the Indian River Lagoon only when there is no demand for irrigation water. Dade, Broward, and Palm Beach counties primarily use Class I deep injection wells and ocean outfalls to dispose of wastewater treated to secondary standards, but they also reuse a small amount of reclaimed water.



Source: Florida Department of Environmental Protection, 2001

Figure 2-1. Municipal Wastewater Treatment Plants in South Florida

Table 2-1. Wastewater Treatment Plants Discussed in This Report

Wastewater Treatment Plant	County	Type of Disposal	Treatment	Design or Current Capacity in mgd)[a, b]
Cape Canaveral	Brevard	Surface water, reuse	Secondary and High-level disinfection	1.80
South Beaches	Brevard	Surface water, reuse, deep-well injection[c]	Secondary and High-level disinfection	12.4
City of Fort Lauderdale[d]	Broward	Deep-well injection	Secondary	43
City of Sunrise (Sawgrass)[d]	Broward	Deep-well injection	Secondary	13
City of Hollywood[d, e]	Broward	Some Reuse, Ocean outfall	Secondary and High-level disinfection	42
Broward County North Regional[d, e]	Broward	Some Reuse, Ocean outfall, deep-well injection	Secondary and High-level disinfection	80
Golden Gate (Naples)[d]	Collier	Reuse	Secondary and High-level disinfection	0.95
Miami-Dade South District[d]	Dade	Deep-well injection	Secondary	112.5
Miami-Dade Central District[e]	Dade	Ocean outfall, deep-well injection	Secondary	121
Miami-Dade North District[d, e]	Dade	Ocean outfall, deep-well injection Some reuse	Secondary and High-level disinfection	112.5
Howard F. Curren (Tampa)	Hillsborough	Surface water, reclaimed	Advanced	96
Seacoast[d]	Palm Beach	Reuse and Deep-well injection	Secondary and High-level disinfection	12
Boca Raton[d, e]	Palm Beach	Some reuse, Ocean outfall	Secondary and High-level disinfection	20
South Central Regional/Delray Beach[d, e]	Palm Beach	Ocean outfall	Secondary and High-level disinfection	24
Albert Whitted	Pinellas	Deep-well injection, Some reuse[c]	Secondary and High-level disinfection	12.4
Gulf Gate[d]	Sarasota	Surface water	Advanced	1.80
South Gate[d]	Sarasota	Surface water, reuse	Advanced	1.36

[a] mgd = million gallons per day
[b] FDEP, 2001
[c] US EPA, 1997
[d] Englehardt et al., 2001
[e] Hazen and Sawyer, 1994

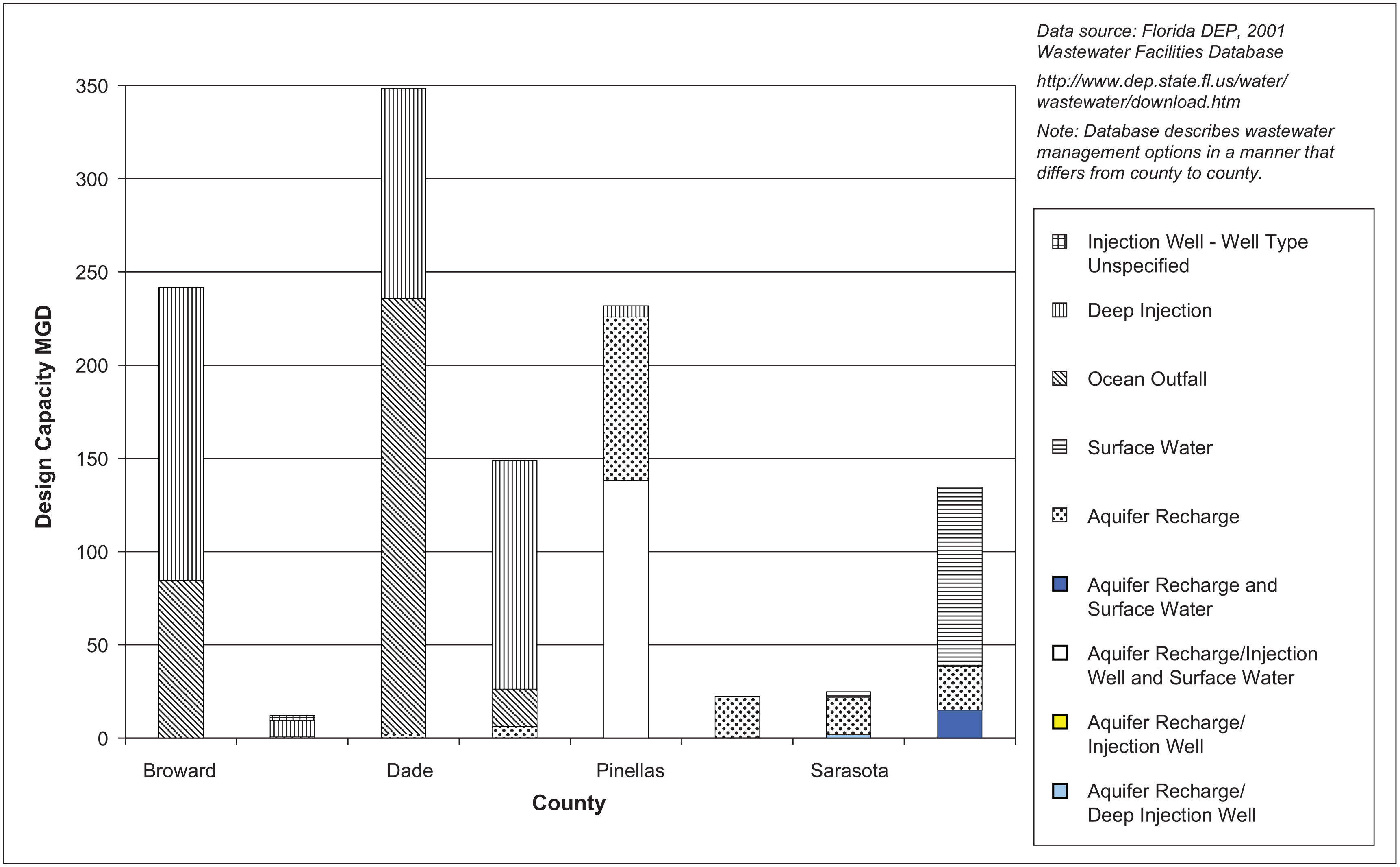


Figure 2-2. Wastewater Management Options and Design Capacities for Counties in South Florida

Approximately 1.2 million people are served by the Dade Central and Dade North District wastewater treatment plants, which discharge a total of approximately 230 million gallons per day (mgd) to the open ocean (Marella, 1999). Both outfalls have multi-port diffusers. In Broward County, approximately 80 mgd are treated and discharged to the Atlantic Ocean (Marella, 1999). (Note: This is 1995 data and may not reflect the impact of Class I injection wells that became operative in 1996; at this time, discharge to the ocean may have been diverted to the Class I wells.)

Wastewater treatment facilities located in Brevard, Collier, and Pinellas counties are permitted to discharge to surface waters. However, these facilities often use other management options, such as spray irrigation, in conjunction with discharges to surface water. When there is no need for spray irrigation, treated wastewater may be discharged into a surface-water body or injection well. For example, the South Beaches wastewater treatment facility in Brevard County discharges into the Indian River Lagoon when there is no demand for irrigation water.

In Sarasota, two wastewater treatment plants, Gulfgate and Southgate, discharge into freshwater canals (Phillippe Creek and Methany Creek). These eventually drain to Roberts Bay (Camp, Dresser, McKee, 1992; Roat and Alderson, 1990). The Sarasota facilities have no alternative for discharging wastewater and thus treat to advanced wastewater standards at all times.

In Pinellas County, the City of Clearwater and the City of Bellaire have permits to discharge to surface waters. Bellaire discharges to Clearwater Bay, and the City of Clearwater Northeast Wastewater Treatment Plant discharges to Tampa Bay. These facilities also have the option of reusing treated or reclaimed wastewater.

Each of the four studied methods of managing treated wastewater is described briefly below and in more detail in Chapters 4 through 7.

2.1.1 Class I Deep-Well Injection

Class I underground injection wells are used to dispose of secondary treated municipal wastewater to deep geologic strata. Injection zones are selected so that they are situated beneath the lowermost geologic formation that contains an underground source of drinking water (FDEP, 1999). An underground source of drinking water (USDW) is defined as an aquifer, or portion of an aquifer, with a sufficient quantity of ground water to supply a public water system and containing a total dissolved solids concentration of less than 10,000 milligrams per liter (mg/L) (FDEP, 1999; 40 CFR 144.3).

Class I wells are located throughout the South Florida study area, including Dade, Brevard, and Pinellas counties. Wastewater is injected at depths ranging from 650 to 3,500 feet below the land surface (US EPA, 1998). Management of treated municipal wastewater by Class I deep-injection wells constitutes approximately 20 percent (0.44 billion gallons per day) of the total wastewater disposal capacity in Florida, based on design capacity (FDEP, 1997).

Movement of injected fluids into USDWs by Class I is prohibited by Federal and State requirements. A major purpose of the Federal and State regulations is to protect the quality of USDWs by regulating the construction and operation of injection wells to ensure that the injected fluid remains in the injection zone. 40 CFR 146 establishes criteria and standards that apply to the construction, operation, and monitoring of Class I wells. Many specific regulations governing the construction and operation of injection wells serve to prevent fluid movement into USDWs.

Chapter 4 discusses deep-well injection in greater detail and examines potential human and ecological risks associated with this wastewater management option.

2.1.2 Aquifer Recharge

Aquifer recharge involves the infiltration of water into the ground and includes such practices as infiltration basins, percolation ponds, wetland treatment systems, and irrigation of turf, landscaped areas, and crops. Ultimately, these result in recharging groundwater aquifers and may benefit wetlands habitat as well. For these reasons, aquifer recharge using reclaimed wastewater is widely considered to be a beneficial reuse of treated wastewater.

Under the State of Florida's regulatory framework (the Florida Administrative Code [FAC]), Chapter 62-600 contains definitions of secondary treatment, disinfection levels, and requirements for effluent disposal systems; and Chapter 62-610 contains detailed requirements for a wide range of reuse options; and that Chapter 62-611 regulates discharges to wetlands.

Chapter 5 discusses aquifer recharge in greater detail and examines potential human and ecological risks associated with this wastewater management option. Wastewater treatment and disinfection is discussed in detail in Section 2.3.

2.1.3 Ocean Outfalls

There are six existing publicly owned treatment facilities that use ocean outfalls for management of treated wastewater in South Florida (Hazen and Sawyer, 1994). A seventh ocean outfall with limited discharge capacity is located in the Florida Keys, according to Hoch et al. (1995). The six major ocean outfalls in southeast Florida discharge effluent from the Dade Central District, Dade North District, City of Hollywood, Broward County, Delray Beach, and Boca Raton treatment facilities. The outfalls discharge secondary-treated chlorinated wastewater effluent at ocean depths ranging from 27.3 meters to 32.5 meters. Discharge points are located between 1,515 and 5,730 meters offshore.

The southeast Florida outfalls discharge along the western boundary of the Florida Current, a tributary of the Gulf Stream. The Florida Current is a fast-flowing current, with maximum current speeds occurring in the Florida Strait between southeast Florida and the Bahamas, in the vicinity of the southeast Florida outfalls. Maximum current speeds measured at the outfall sites during the Southeast Florida Outfall Experiment (SEFLOE) were upwards of 60 to 70 centimeters per second. The speed and strength of the Florida Current causes effluent plumes to be rapidly dispersed (Huang et al., 1998; Proni et al., 1994; Proni et al., 1996; Proni and Williams, 1997).

Chapter 6 discusses ocean outfall disposal in greater detail and examines potential human and ecological risks associated with this wastewater management option.

2.1.4 Surface-Water Discharges

Surface-water disposal consists of discharge of treated municipal wastewater into estuaries, lagoons, canals, rivers, or streams. Surface-water discharge of treated municipal wastewater is limited and discouraged in South Florida because of potential ecological and health concerns. There are no known permitted discharges into fresh water lakes or ponds in South Florida (personal communication, K. Muldoon, Florida DEP). Discharge into canals is the predominant form of surface-water discharge (Marella, 1999; Kapadia and Swain, 1996; Englehardt et al., 2001; personal communication, K. Muldoon, Florida DEP). Discharges into estuaries may also be permitted. Tampa Bay, Roberts Bay, and the Indian River Lagoon each receive surface-water discharges through discharges into canals or estuaries that empty into these coastal embayments (City of Tampa Bay Study Group, 2001).

Wastewater intended for discharge to certain coastal embayments generally must be treated to advanced wastewater treatment standards. Advanced wastewater treatment refers to secondary treatment, plus further removal of nitrogen and phosphorus to attain the 5mg/L $CBOD_5$, 5 mg/L TSS, 3 mg/L total nitrogen (as N) and 1 mg/L total phosphorus (as P) or treatment to water-quality-based effluent standards. Discharge to Tampa Bay and Indian River Lagoon areas must be treated to these standards. While it represents a reasonable assumption for the level of treatment required for surface water discharges, it is not a formal statewide requirement.

Most surface-water discharges are also subject to water-quality-based effluent limits (WQBELs) established using the processes outlined in Chapter 62-650, F.A.C. WQBELs generally include nutrient limits for nitrogen and phosphorus established to protect water quality in the receiving waters. This may include very stringent nutrient limits. While filtration may be needed to achieve the TSS limit, it is not specifically designed to remove pathogenic protozoa, nor is it required to do so. In addition, any new or expanded surface water discharge is subject to Florida’s Antidegradation Policy.

Chapter 7 discusses surface water discharges in greater detail and examines potential human and ecological risks associated with this wastewater management option.

2.2 Drinking Water in South Florida

Concerns about potential effects on drinking-water quality lie at the heart of stakeholder anxieties regarding management of treated wastewater. In order to evaluate potential human health risks associated with these management options, it is important to understand the sources of drinking water used by South Florida communities.

The USGS National Water Quality Assessment Program (NAWQA) has estimated that ground water accounts for approximately 94 percent (872 million gallons per day, or mgd) of the water used by 5.8 million people in South Florida as of 1990, generally from wells less than 250 feet deep in the surficial aquifer. The remaining 6 percent of drinking water is supplied by surface water sources (McPherson et al., 2000). (Note that the NAWQA report encompasses an area of South Florida that is approximately similar to the area of this risk study, with the exclusion of a portion of Sarasota County and the inclusion of several other counties not addressed in this study.)

Most Community Water Systems within the geographic area covered by this study are supplied by ground water. As of October 18, 2001, a total of 133 Community Water Systems in five counties (Brevard, Broward, Dade, Palm Beach, and Pinellas Counties) provide ground water from their own wells or purchase ground water from nearby utilities. Current figures indicate that only 12 Community Water Systems provide surface water to their customers (US EPA, 2001).

Water suppliers that use ground water generally use either the Floridan Aquifer or the Biscayne Aquifer as a water source. The Biscayne Aquifer underlies 4,000 square miles in Broward, Dade, and Palm Beach Counties. The Miami-Dade Water and Sewer Department withdraws approximately 330 mgd from the Biscayne Aquifer for distribution to the City of Miami and surrounding communities. The City of Fort Lauderdale draws water from the Biscayne Aquifer as well. The City of St. Petersburg, in Pinellas County, purchases ground water (from the Floridan Aquifer).

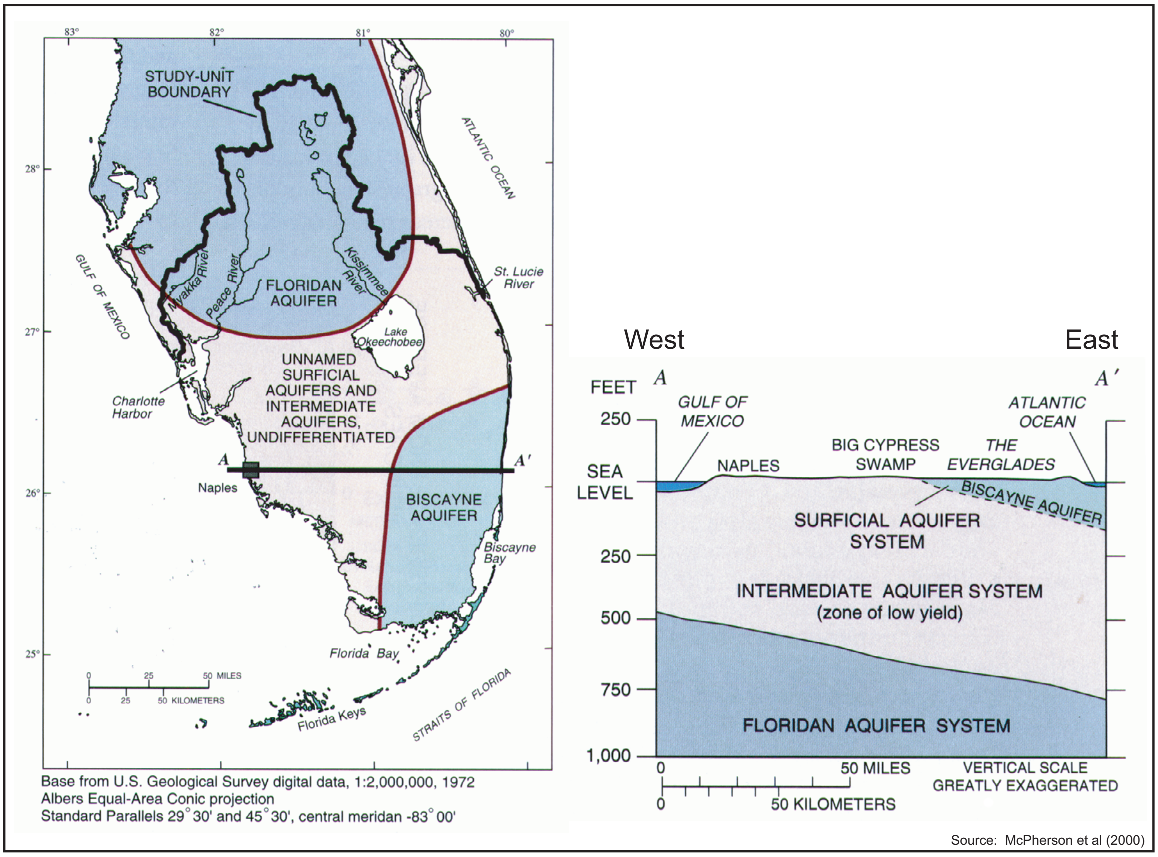


Figure 2-3. Hydrologic Profile of South Florida Aquifer System

2.2.1 Floridan Aquifer System

The Floridan Aquifer System underlies approximately 100,000 square miles in southern Alabama, southeastern Georgia, southern South Carolina, and all of Florida. Several large cities in the southeastern United States use the Floridan Aquifer as a drinking water source, including St. Petersburg in Florida. In addition, the aquifer is a source of water for many smaller communities and rural areas. During 1985, approximately three billion gallons per day of fresh water were withdrawn from the Floridan Aquifer (USGS, 2000).

In most places, the Floridan Aquifer can be divided into two aquifers (the Upper and Lower Floridan aquifers) with a confining layer of material in between. The hydraulic properties and geology of the Upper Floridan aquifer are better known than the properties of the Lower Floridan because the Lower Floridan occurs at greater depths than the Upper Floridan, and therefore fewer borehole data are available. Most of the fresh water that is withdrawn from the Floridan Aquifer is pumped from the Upper Floridan.

Since 1988, approximately 320 million gallons per day of wastes are injected into disposal wells that empty into the Lower Floridan; about 97 percent of this volume is municipal wastewater.

2.2.2 Biscayne Aquifer System

The Biscayne Aquifer system, the main source of water for Dade, Broward, and southeastern Palm Beach Counties, underlies approximately 4,000 square miles (USGS, 2000). In 1985, approximately 786 million gallons per day of fresh water were withdrawn from the aquifer for all purposes; withdrawals as of 1990 were somewhat greater. About 70 percent of the water is estimated to be withdrawn for public supply. Major population centers that depend on the Biscayne aquifer for water supply include Boca Raton, Pompano Beach, Fort Lauderdale, Hollywood, Hialeah, Miami, Miami Beach, and Homestead. Water from the Biscayne Aquifer also supplies the Florida Keys with water transported from the mainland by pipeline.

Because the Biscayne Aquifer lies at shallow depths and is highly permeable, it is highly susceptible to contamination. According to the USGS, this aquifer is the sole source of drinking water for 3 million people.

The Biscayne Aquifer lies on top of the Floridan Aquifer, and is separated from that deeper aquifer by approximately 1,000 feet of low-permeability clay deposits. The Biscayne Aquifer ranges in thickness from a few feet in the west to about 240 feet near the Florida coast.

2.2.3 Surficial Aquifer

In areas of South Florida outside the Biscayne Aquifer, the unnamed surficial aquifer is used locally for community and public water supply.

2.2.4 Drinking-Water Quality in South Florida Communities

The City of St. Petersburg purchases ground water pumped by the City of Tampa from the Floridan Aquifer. Routine monitoring reported in the city's 2000 Water Quality Report indicates that the water system produces drinking water that meets all Federal and State drinking water standards. According to data in the report, the concentrations of all constituents in the water were below Federal and State Maximum Contaminant Levels (MCLs). The maximum concentration of arsenic (MCL 50 ug/l) was 3.3 ug/l and the maximum concentration of nitrate (MCL for nitrate is 10 mg/l) was 0.05 mg/l during the latest round of water quality testing.

Dade County withdraws approximately 330 million gallons per day of fresh water for distribution to Miami and surrounding communities. The Miami-Dade 2000 Water Quality Report indicates that concentrations of all constituents detected in the water were below Federal and State MCLs. The concentration of nitrate as measured at nine water treatment plants ranged from ND (not detected) to 7 mg/l; the concentration of arsenic at the nine plants ranged from ND to 2 ug/l.

The Biscayne Aquifer is used by millions as a source of drinking water and is suitable for most other purposes. In some areas in Broward county and portions of Dade County, however, the water is colored as a result of decomposing organic material in the aquifer. While this coloration is an aesthetic issue, it does not present a risk to human health.

Canals managed by the South Florida Water Management District have been used in South Florida to control flooding and drainage. These canals are hydraulically connected to the Biscayne Aquifer and present a potential contamination route. Major sources of contamination to the Biscayne Aquifer include salt water intrusion and infiltration of contaminants from the canal system. Other potential sources of contamination include the infiltration of substances spilled on the ground, fertilizer carried in surface runoff, septic tanks, and improperly constructed disposal wells.

2.3 General Description of Wastewater Treatment

2.3.1 Wastewater Treatment Methods Used in Florida

In the State of Florida, there are four primary means of managing treated municipal wastewater:

- Release of treated wastewater effluent to ocean outfalls
- Release of treated wastewater effluent to surface waters
- Aquifer recharge of reclaimed wastewater
- Underground injection of treated wastewater into subsurface geologic formations using Class I injection wells.

A precise knowledge of the regulation, treatment, and disinfection of municipal wastewater is important for evaluating and understanding human health and ecological risks associated with the four different wastewater management alternatives. Treatment and regulatory oversight are two critically important risk management tools that greatly affect the final risk determination.

Regulations governing water-quality treatment and the quality of water in receiving water bodies are important because they require that wastewater be treated to a certain standard that depends on its management method; therefore, treated wastewater is likely to have a composition that falls within a predictable range. Risk assessment is made simpler when the quality of treated wastewater can be expected to be fairly predictable. Furthermore, regulations concerning water quality are based upon rational evidence that human health or ecological entities would be better protected if such standards were met. Risk assessment is made easier when such standards exist. In addition, comparison of risks of different management options may depend to a large extent upon the kind and amount of treatment required. Regulations for treatment of wastewater and standards for receiving waters are discussed generally in Chapter 3 and in Chapters 4 through 7 for each wastewater management option.

In order to understand how wastewater treatment reduces risks, it is helpful to understand the composition of untreated wastewater and to compare it with that of treated wastewater. Typical untreated (raw) municipal wastewater contains a variety of constituents, the concentration of which depends on the type and size of commercial and industrial flows added and on the amount and quality of ground water infiltrating into the sewage system. For instance, food-handling wastewater (for example, from food stores and restaurants) can have higher concentrations of organic matter than typical domestic wastewater, while industrial flows may exhibit higher levels of metals. Untreated wastewater typically contains notably high concentrations of pollutants, including organic and inorganic compounds, microorganisms and metals (WPCF, 1983; Metcalf and Eddy, 1991; Richardson and Nichols, 1985; Krishnan and Smith, 1987; and Williams, 1982). Table 2-2 lists typical concentrations and ranges of several raw wastewater constituents as well as the percent removal of these constituents that can be achieved using primary and secondary wastewater treatment methods.

Table 2-2. Typical Levels of Constituents in Wastewater and Percent Removal Using Treatment (Primary and Secondary)

	Raw Wastewater (mg/L)		Percent Removal		Secondary Effluent (mg/L)	
Constituent	**Typical**	**Range**	**Primary**	**Secondary**	**Typical**	**Range**
BOD_5	220	110–400	0–45	65–95	20	10–45
COD	500	250–1000	0–40	60–85	75	35–75
TSS	220	100–350	0–65	60–90	30	15–60
VSS	165	80–275	—	—	—	—
NH_4-N	25	12–50	0–20	8–15	10	<1–20
$NO_3 + NO_2$-N	0	0	—	—	6	<1–20
Org-N	15	8–35	0–20	15–50	4	2–6
TKN	40	20–85	0–20	20–60	14	10–20
Total N	40	20–85	5–10	10–20	20	10–30
Inorg P	5	4–15	—	—	4	2–8
Org P	3	2–5	—	—	2	0–4
Total P	8	6–20	0–30	10–20	6	4–8
Arsenic	0.007	0.002–0.02	34	28	0.002	—
Cadmium	0.008	<0.005–0.02	38	33–54	0.01	<0.005–6.4
Chromium	0.2	<0.05–3.6	44	58–74	0.09	<0.05–6.8
Copper	0.1	<0.02–0.4	49	28–76	0.05	<0.02–5.9
Iron	0.9	0.10–1.9	43	47–72	0.36	0.10–4.3
Lead	0.1	<0.02–0.2	52	44–69	0.05	<0.02–6.0
Manganese	0.14	0–0.3	20	13–33	0.05	—
Mercury	0.001	<0.0001–0.0045	11	13–83	0.001	<0.0001–0.125
Nickel	0.2	—	—	33	0.02	<0.02–5.4
Silver	0.022	0.004–0.044	55	79	0.002	—
Zinc	1.0	—	36	47–50	0.15	<0.02–20

Note: Partially adapted from WPCF, 1983; Metcalf and Eddy, 1991; Richardson and Nichols, 1985; Krishnan and Smith, 1987; and Williams, 1982.
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Raw wastewater must be treated at a wastewater treatment facility prior to discharge, regardless of the disposal method. Wastewater treatment facilities provide what is known as primary, secondary, and/or tertiary or advanced treatment. The dividing boundaries between these levels of treatment can become blurred, especially in recent years with the development of new processes that can accomplish several treatment objectives at once. As Table 2-2 indicates, percent removal of raw wastewater constituents depends largely on the level of treatment, though it is important to note that even primary treatment alone will produce a much cleaner effluent. Treatment facilities are designed to meet national, state and local treatment standards, and the processes are chosen on the basis of those standards and local wastewater composition. Most importantly, the level of treatment is dictated by the disposal or reuse option chosen.

Wastewater treatment and disinfection methods and levels are summarized below. A summary of treatment methods used in South Florida is presented in Table 2-4. Disinfection methods are summarized in Table 2-5. Treatment and disinfection for different wastewater management options are discussed fully in Chapters 4 through 7.

2.3.2 Definitions of Wastewater Treatment Methods and Levels of Disinfection

Primary wastewater treatment generally consists of physical separation of solids from the wastewater and includes screening and grinding operations, as well as sedimentation.

Secondary wastewater treatment provides for the removal of suspended solids and biodegradable organic matter using chemical and biological processes before discharge to receiving waters. Secondary treatment, which often includes basic disinfection (described below), is required for ocean discharge but disinfection is not required for underground injection via Class I injection wells. Pursuant to the Clean Water Act, EPA first issued its definition of secondary treatment in 1973. Current Federal standards for secondary treatment are included in 40 CFR Part 133 and presented in Table 2-3. The State's requirements for secondary treatment are contained in Chapter 62-600, F.A.C.

Table 2-3. National Standards for Secondary Treatment

Parameter	Minimum % Removal	Maximum 7-Day Avg.	Maximum 30-Day Avg.
BOD_5, mg/L	85	45	30
TSS, mg/L	85	45	30
pH, units	Within range of 6.0 to 9.0 at all times		

Most secondary treatment of domestic wastewater is accomplished using activated sludge processes. These processes utilize microorganisms already present in the wastewater. The wastewater is aerated and mixed vigorously, which increases contact between the microorganisms and both organics and oxygen. The microorganisms oxidize the dissolved and suspended organics into carbon dioxide and water. Inorganic and organic nitrogen, sulfur, and phosphorus are oxidized to nitrates, sulfates, and phosphates. Some suspended organic and mineral solids are not broken down; these are settled out in clarifiers or a clarification step. The liquid flows out of the top of the clarifier, and after undergoing whatever final treatment is required, it is on its way out of the wastewater treatment facility.

Principal treatment and disinfection (more advanced secondary) requires secondary treatment and high-level disinfection. The reclaimed water must meet a standard of 5.0 mg/L of total suspended solids before application of the disinfectant and total nitrogen is limited to 10 mg/L. Filtration is also required for total suspended solids control, increasing the ability of the disinfection process to remove protozoan pathogens.

Reclaimed water treatment requires secondary treatment, filtration, and high-level disinfection. The quality of water discharged via reclaimed water treatment systems is intended to be high so that it may be reused. Reclaimed water treatment is required if wastewater is being reclaimed for reuse. A standard of 5.0 mg/l TSS (a single sample maximum applied after the filter and before the application of the disinfectant) is required for reuse projects permitted under Part III of Chapter 62-610, F.A.C. Part III imposes a number of additional operational and reliability requirements.

Advanced (or tertiary) wastewater treatment is a term of art that simply means wastewater treatment beyond secondary treatment such as processes that are used if there are requirements to remove specific components, such as nitrogen and phosphorus, which are not removed by the secondary treatment.

Basic disinfection must result in not more than 200 fecal coliforms per 100 ml of reclaimed water of effluent sample. Where chlorine is used, facilities must provide for rapid and uniform mixing and a total chlorine residual of at least 0.5 milligram per liter shall be maintained after at least 15 minutes contact time at the peak hourly flow. Higher residuals or longer contact times may be needed. (See Rule 62-600.440(4) F.A.C.)

High-level disinfection includes additional removal of total suspended solids (TSS) beyond secondary treatment, to achieve a TSS concentration of 5.0 mg/L or less before the application of disinfectant, in order to maximize disinfection effectiveness. It results in reclaimed water in which fecal coliform values (per 100 ml of sample) are below detectable limits (at least 75% of all observations: with no single sample above 25/100 mL. Where chlorine is used, facilities must provide for rapid and uniform mixing and a total chlorine residual of at least 1.0 milligram per liter must be maintained at all times. Larger residuals or longer contact times may be required and as well as minimum contact times if chlorine is used as the disinfectant. This requirement does not preclude an additional application of disinfectant prior to filtration for the purpose of improving filter performance. (See Rule 62-600.440(5) F.A.C.)

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